

Toward Autonomous Stable Energy Management of Hybrid Electric Aircraft Propulsion Systems, Phase II

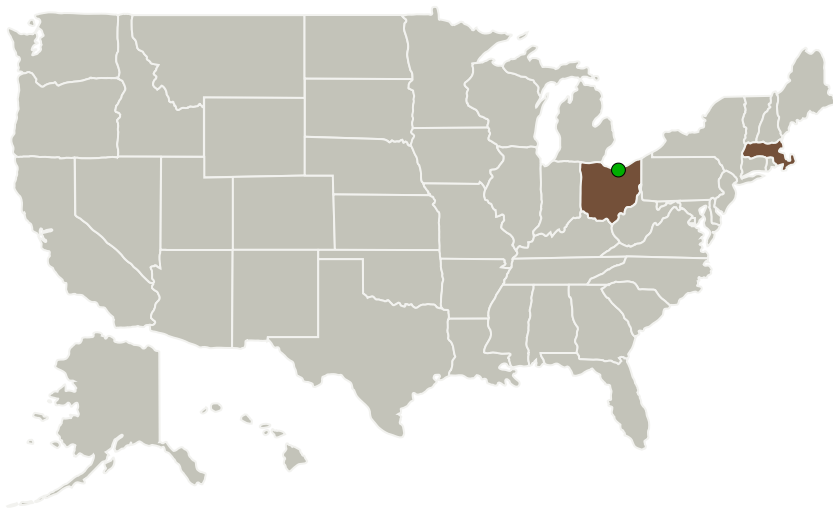
Completed Technology Project (2016 - 2018)



Project Introduction

We have demonstrated the ability of our Dynamic Monitoring and Decision Systems (DyMonDS) framework to structure a systems approach to the modeling and control of aircraft electric power systems. To begin, we selected two example aircraft power systems and developed dynamic models for those systems within the DyMonDS framework. Next, we derived optimized sets of control set points for the power systems. Each set of set points constituted an optimized allocation of resources under an assumed aircraft operating condition. A separate set of control set points was derived for each assumed operating condition. To do so the selected aircraft electric power systems were first mapped into equivalent terrestrial power systems. The NETSS optimization software for terrestrial electric power systems was then applied to optimize the aircraft power systems. Finally, we developed and stabilizing controllers for electric power system operation around each set point set. To do so, critical, and potentially unstable, aircraft electric power system dynamics were first identified for closed-loop control. Finally, the required controllers were designed and simulated to show that they indeed stabilized the dynamics around the prescribed set points. All accomplishments were greatly facilitated by the DyMonDS framework.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
New Electricity Transmission Software Solutions(NETSS)	Lead Organization	Industry Women-Owned Small Business (WOSB)	Sudbury, Massachusetts
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

Massachusetts	Ohio
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Project Transitions

May 2016: Project Start

May 2018: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139914>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

New Electricity Transmission Software Solutions (NETSS)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

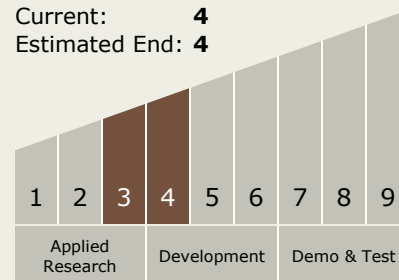
Sanja Cvijic

Technology Maturity (TRL)

Start: **3**

Current: **4**

Estimated End: **4**



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Technology Areas

Primary:

- TX10 Autonomous Systems
 - └ TX10.2 Reasoning and Acting
 - └ TX10.2.6 Fault Response

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System